

## UNITED STATES PATENT OFFICE

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## LUBRICANT

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The present invention relates to an improved lubricant and more specifically to a semi-fluid grease principally for automotive chassis lubrication and for similar purposes. The invention will be fully understood from the following description.

In the lubrication of automotive chassis, it has been found desirable to provide a semi-fluid grease which has a high degree of adhesivity in order to withstand the continual pounding of the shackles, spring bolts and other parts, which pounding tends to cause the grease to be squeezed out of the bearing and lost by spattering. At the same time, this adhesivity cannot be gained by excessive hardening of the grease since this result would greatly increase the dispensing difficulties. It is necessary therefore that the grease be highly adhesive, but soft enough to be dispensed with the usual type of grease guns.

It has been found that the above results can best be achieved by adding certain specific aluminum soaps to viscous petroleum oils in certain specific proportions. The oil preferred for this purpose is derived from a naphthenic base, for example, from oils of the Coastal type with a high viscosity, that is, above 150 seconds Saybolt at 210° F., and preferably in the range from 160 to 220 seconds. The most suitable soaps to be added are those of aluminum. In making up the lubricant, from 3 to 8%, and preferably about 5% of aluminum stearate is used, but it will be understood that similar aluminum soaps of saturated fatty acids may be substituted. The aluminum stearate is readily dissolved in the oil, but it causes the latter to set into firm gel which is undesirable. This result can be avoided by the addition of a relatively small amount of non-gelling aluminum soaps, such as aluminum naphthenate or aluminum oleate containing approximately 20% of free stearic acid. The commercial aluminum stearates vary in the percentage of free acid from approximately 5 to 15 to even greater amounts. The soaps having the greater percentage of aluminum tend to form firmer gels and it has been found that by increasing the percentage of free stearic acid to 20% (total) or using the aluminum stearates containing this amount of free acid, a softer and more adaptable grease is formed. It has also been found that this additional free fatty acid during storage also prevents the grease from setting back to its original firmness after working. The amount of aluminum naphthenate or oleate varies from about 0.25 to 1.5%; that is

to say, the amount is ordinarily about  $\frac{1}{6}$  to  $\frac{1}{5}$  of the amount of the aluminum stearate.

In manufacturing the grease, the aluminum soaps and enough free stearic acid to bring the fatty acid content of the aluminum soap to 20% free fatty acid are added and thoroughly admixed with a small portion of the oil, say about 10 to 20% of the total quantity to be used, and the ingredients are worked together in a thick paste. The paste is then stirred into the balance of the oil which is heated during the stirring to a temperature of 280 to 350° F., and held at that temperature until all of the soap is thoroughly incorporated into a smooth homogeneous mixture. Aluminum naphthenate of commerce varies considerably according to its water content and if it is very well dried, it generally requires a higher temperature in order to bring it into the solution. In such a case, it is found preferable to add aluminum naphthenate to the oil and to heat up to a temperature of 350 to 450° F., while stirring, and then to add the aluminum stearate to this mixture just as indicated before at a temperature from about 280° to 350° F.

The hot mixture is then allowed to cool and sets into a soft body which may be worked down by stirring into a smooth fluid grease. It should be fluid enough so as to just flow under its own weight while at room temperature and ordinarily has an A. S. T. M. penetration of about 300 to 400 at 77° F. A grease of this type can be dispensed readily in grease guns of the ordinary type at temperatures as low as 0° F., and is at the same time possessed of the desired high degree of adhesivity.

The grease described above may contain other ingredients if desired; for example, the viscosity may be considerably increased by the addition of thickeners, such as the polymers of olefins especially iso-olefins, iso-butylene and iso-amylenes. For this purpose, the polymers having molecular weights of 30,000 to 200,000 are to be preferred and they are ordinarily used in proportions from about 0.05 to 0.25%, depending upon the molecular weight of the polymer used. Oxidation inhibitors of various types may be added to the oil as well as dyes, anti-corrosion or extreme pressure agents and the like, which may be employed in order to give other qualities.

*Example*

A chassis lubricant was made up by adding  $4\frac{1}{2}$  parts by weight of aluminum stearate containing 10% free fatty acid,  $\frac{1}{2}$  part stearic acid and  $\frac{1}{2}$  part of aluminum naphthenate (the

naphthenic acid obtained from a Venezuelan gas oil) to about 15 parts of a naphthenic lubricating oil which had an initial viscosity of 170 seconds Saybolt at 210° F. The ingredients were stirred together into a thick paste and after thorough incorporation 78.5 parts of the same lubricating oil previously used were added and the mixture was heated while stirring to about 300° F. The stirring continued for about 2 hours and the mixture was found to be completely homogeneous. While still fluid, one part by weight of an oil solution of a linear polymer of isobutylene, having a molecular weight of about 55,000 was added for the purpose of thickening the oil. On cooling the mixture set into a soft solid body which was then worked into a smooth semi-fluid grease which was just soft enough to flow under its own weight at room temperature.

The semi-fluid grease had an A. S. T. M. penetration of 300 at 77° F. It was highly adhesive and showed little or no tendency to drop off the shackles or spring bolts or to spatter. It could be readily dispensed at 0° F., with an ordinary grease gun. The following table will show the effect of the free stearic acid on the consistency of the greases after storage:

A. S. T. M. penetration

| Free stearic acid in the aluminum stearate | Grease freshly prepared as described above | After 2 weeks storage |
|--------------------------------------------|--------------------------------------------|-----------------------|
| 20%-----                                   | 387                                        | 335                   |
| 15%-----                                   | 378                                        | 282                   |
| 10%-----                                   | 370                                        | 255                   |

The present invention is not to be limited by any theory of the method of manufacture or to any particular types of aluminum soap, but only to the following claims in which it is desired to claim all novelty inherent in the invention.

We claim:

1. An improved chassis lubricant comprising a viscous lubricating oil, about 3 to 8% of an aluminum soap of a saturated fatty acid and not more than about 1% of aluminum naphthenate.

2. An improved lubricant for automotive chassis, comprising a viscous hydrocarbon oil, 3 to 8% of aluminum stearate, and from about 0.25 to 1.5% of aluminum naphthenate, the same being incorporated so as to form a homogeneous semi-fluid grease just capable of flowing under its own weight at room temperature.

3. An improved lubricant for automotive chassis, comprising mineral lubricating oil having a viscosity of from 160 to 180 sec. Saybolt at 210, 3 to 8% of aluminum stearate, about 0.25 to 1.5% of aluminum naphthenate, the same being worked into a homogeneous semi-fluid grease having a penetration of about 300 to 400 at 77° F.

4. Product according to claim 1 in which the oil is a naphthenic base crude distillate containing a small amount of an added linear iso-olefin polymer as a thickener.

5. An improved lubricant for automotive chassis, comprising a lubricating oil of 150 to 200 sec. Saybolt at 210° F., about 5% of aluminum stearate, about .5% of aluminum naphthenate and about 0.1% of polyisobutylene as a thickener, the whole being worked into a homogeneous semi-fluid grease having a penetration of from 300 to 400 at 77° F., and just capable of flow under its own weight at ordinary temperature.

6. An improved chassis lubricant comprising a viscous lubricating oil derived from a naphthenic type crude, about 3 to 8% of an aluminum soap of a saturated fatty acid and not more than about 1% of aluminum naphthenate.

7. An improved lubricant for automotive chassis comprising a lubricating oil of 150 to 200 seconds Saybolt at 210° F., about 5% of aluminum stearate containing at least 5-30% of free stearic acid, about 0.5% of aluminum naphthenate and about 0.1% of polyisobutylene as a thickener, the whole being worked into a homogeneous semi-fluid grease having a penetration of from 300-400 at 77° F., and just capable of flow under its own weight at ordinary temperatures.

8. An improved lubricant for automotive chassis comprising a lubricating oil derived from a naphthenic type crude and of 150-200 seconds Saybolt at 210° F., about 5% of aluminum stearate containing at least 5-30% of free stearic acid, about 0.5% of aluminum naphthenate and about 0.1% of polyisobutylene as a thickener, the whole being worked into a homogeneous semi-fluid grease having a penetration of from 300-400 at 77° F., and just capable of flow under its own weight at ordinary temperatures.

9. An improved chassis lubricant according to claim 1 in which the amount of aluminum naphthenate is about  $\frac{1}{16}$  of the amount of the aluminum soap of the saturated fatty acid.

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